(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2002 (26.09.2002)

PCT

(10) International Publication Number
WO 02/074216 A2

(51) International Patent Classification[7]: A61G

(21) International Application Number: PCT/US02/08015

(22) International Filing Date: 15 March 2002 (15.03.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/276,035 16 March 2001 (16.03.2001) US

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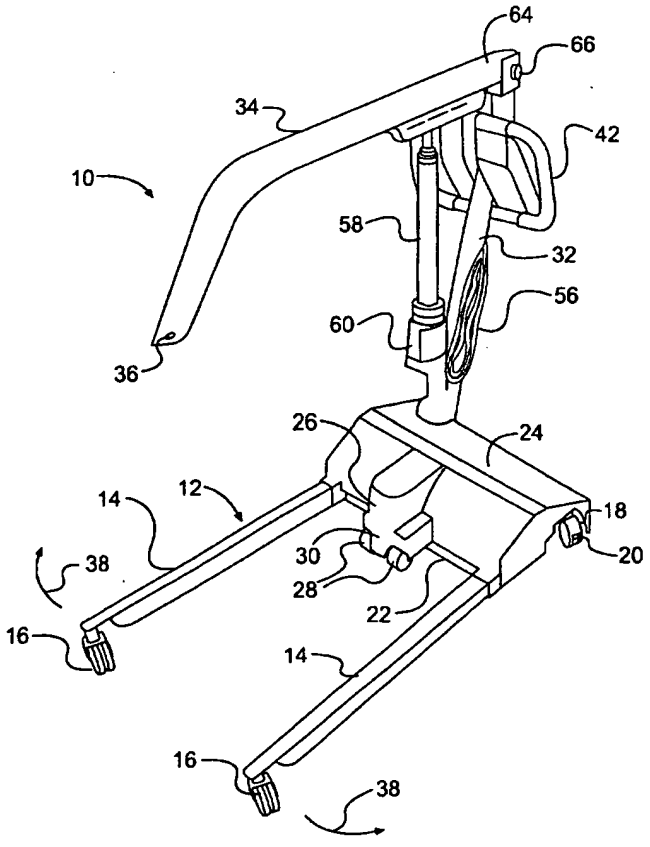
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: PATIENT LIFT/TRANSPORT WITH POWER ASSIST



(57) Abstract: A patient lift and transport device (10) includes a wheeled chassis (12) with a powered wheel assembly (26). The powered wheel assembly (26) includes a wheel (28) or plurality of wheels which can be permanently or selectively positioned in contact with the floor to provide motive force which propels the device (10) in a forward or reverse direction. Preferably, the wheel or wheels (28) are fixed to allow only linear translation, as this tends to aid in control of the directionality of the caster wheels (16 and/or 18). An attendant uses a handle bar (42) or other steering mechanism affixed to the mast (32) to direct the movement of the patient lift and transport device (10). A boom (34) connected to the mast (32) is used to raise and lower patients from a reclining or seated position.

WO 02/074216 A2

Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PATIENT LIFT/TRANSPORT WITH POWER ASSIST

DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

The invention is directed to a human patient lift and transport device which may be used in a hospital, clinic, private home, and nursing care facility and, more particularly, to a powered patient lift and transport device which provides for ease in patient handling and maneuverability.

Background Description

Patient lift and transport units are used in hospitals, nursing homes, and private homes to lift or "hoist" an injured or nonambulatory individual from a bed, bathroom facility or other location, and hold the individual suspended above the ground while he or she is transported between locations in a building. Once at a final destination, the individual is lowered to a sitting or reclining position. Conventional patient lift and transport units generally include a wheeled lower metal chassis which generally has four caster wheels, a mast which extends above the lower chassis equipped with handle bars to steer and push or pull the lift and transport unit, and a horizontal boom. A fabric (or other soft material) sling arrangement which holds the patient under lift is attached to the end of the boom using a metal spreader bar or other connector device. The boom is raised or lowered using a hydraulic actuator strut or gear-driven strut that is manually pumped by the attendant or powered using a electric jack mechanism that is powered by a DC electric motor.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a patient lift and transport device which has a mechanism for providing motive force to propel the device in forward and reverse directions without requiring the attendant to push or pull on the lift and transport device.

It is another object this invention to provide a patient lift and transport device with a selectively actuatable power drive mechanism and with a mechanism for regulating power to the power drive mechanism so as to control the speed of movement of the device.

It is another object of this invention to provide a power drive mechanism which assists the attendant in maintaining stable directional control of the moving patient lift and transport device.

It is yet another object of this invention to provide a patient lift and transport device with an improved and sturdy configuration which overcomes disadvantages of prior patient lift and transport devices.

According to the invention, a powered patient lift and transport device includes a powered wheel assembly affixed to the wheeled chassis. The powered wheel assembly allows the wheeled chassis to be propelled along the floor without the attendant exerting undue manual force to propel the lift unit. By having the powered wheel fixed for only linear translations, the directional control of the wheeled chassis is greatly enhanced since this configuration helps in control in the yaw axis of the caster wheels on the wheeled chassis. That is, swiveling and spinning of the caster wheels about a vertical axis is reduced or eliminated under the influence of the linear translation of the powered wheel assembly. This enables the caster wheeled chassis to be moved easily in linear translation in the direction where it is pointed, avoiding crab-like motions and oscillatory behavior. Preferably, the powered wheel can be selectively applied against or removed from contact with the floor. This can be accomplished using a spring, lever, hydraulic actuator, or other configuration which will raise the wheel above the floor and lower it to the floor. Preferably, the powered wheel assembly is spring loaded or otherwise biased against the floor to assure that a

motive force is applied in traction with the floor to propel the patient lift and transport device in a forward or reverse direction. Certain configurations of mounting the powered wheel assembly, to take advantage of the downward force applied by the patient's weight to the chassis, can aid in achieving traction. The speed of the patient lift and transport device preferably can be controlled by regulating the voltage applied to the powered wheel assembly.

A mast and boom or similar assembly is connected to the wheeled chassis. The boom is used to raise and lower patients from a bed, chair, commode, or other location. This is accomplished using a sling or other device which will be connected towards the end of the boom. In the preferred configuration, the powered wheel assembly is located on a crossing member on the wheeled chassis in front of the mast. This configuration makes it easier to assure that the powered wheel assembly stays in contact with the ground when a patient is lifted using the boom, as the patient's weight will impart a downward force on the powered wheel, aiding traction. Preferably, the wheeled chassis includes arm members which can rotate inward and outward so as to accommodate obstructions such as chairs, commodes, and other devices in which a patient may be positioned or to which a patient may be delivered.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of the preferred embodiments of the invention with reference to the drawings, in which:

Figures 1a and 1b are front and rear isometric views of a preferred embodiment of the present invention;

Figure 2 is an enlarged view of the control panel on the preferred embodiment of the present invention shown in Figures 1a and 1b; and

Figure 3 shows a schematic configuration of the inside of the housing on the central crossing member of the wheeled chassis.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

Figures 1a and 1b show a preferred embodiment of a patient lift and transport device 10. The device 10 includes a wheeled chassis 12 which includes two forward extending arms 14 with caster wheels 16 on the ends and two rear caster wheels 18. In some embodiments, wheels which are fixed to translate linearly might be substituted for either caster wheels 16 or caster wheels 18. As shown in Figure 1a, to prevent inadvertent movement of the patient lift and transport device 10, it is advantageous to have at least one of the caster wheels 16 or 18 equipped with a locking mechanism 20 which locks the caster wheel and prevents its rotation in a horizontal axis. Furthermore, it is advantageous in some configurations to have a brake lock on one or more caster wheels to prevent them from rolling.

A central crossing member 22 connects the left side and right side of the chassis 12. The caster wheels 18 are located on the rear side of the central crossing member 22 and the caster wheels 16 are located on the front side. A housing 24 positioned on the central crossing member houses battery power sources and drive mechanisms. Figure 3 shows a schematic diagram wherein the housing 24 includes a battery 72 and drive mechanism 74 for driving the powered wheel assembly 26. The configuration of the battery 72, drive mechanism 74 and other components within the housing can be arranged in a variety of ways, and as well, the battery may be located remotely from the chassis, elsewhere on the lift unit.

A powered wheel assembly 26 is preferably connected to the front side of the central crossing member 22. This mounting location makes it easier to maintain contact with the floor when a patient is hoisted since the weight of the patient would otherwise tend to lift the rear of the chassis 12. In this location, the powered wheel is placed under a downward force created by the patient's weight coupled with the lift assembly's weight, thus aiding in maintaining contact and traction with the floor surface. The powered wheel assembly 26 includes one or more wheels 28 which roll in a forward or reverse direction. The powered wheel assembly 26 preferably is not permitted to rotate about a vertical axis like a caster wheel since such rotation may

make the maneuverability of the patient lift and transport device 10 more difficult. That is, the wheel or wheels 28 is fixed so as to roll in only linear translation in forward and reverse directions. It has been found that by preventing any yaw of the wheel 28 results in the caster wheels 16 and 18 tracking better when the wheeled chassis 12 traverses the floor. It also provides a dynamic characteristic of propelling the lift in the direction where it is pointed by the attendant. When the wheel 18 is able to rotate about a vertical axis similar to a caster wheel, maneuverability of the patient lift and transport device 10 can be adversely impacted because the entire device tends to roll in a circle, stall, oscillate, and/or move in crab-like (sideways) fashion, all making directional control much more difficult for the attendant. Confining the wheels to have only linear translation capability can be achieved by a rigid connection to the drive mechanism and confining the wheels 28 within flanges 30 of the housing 24 which surrounds the powered wheel assembly 26.

Preferably, the wheels 28 can be selectively deployed to engage the floor over which the patient lift and transport device will traverse, and selectively retracted to a non-ground engaging position when powered assist is not desired, or in the event of battery or motor failure. For example, power assist may not be needed during shipping and storage of the patient lift and transport device. In addition, the powered wheel assembly 26 can be equipped with a shock absorber system which allows some play between the floor and the wheels 28 so that patient transport over undulating surfaces will not result in the patient being subjected to discomfort from a bumpy ride, and so as to maintain powered wheel contact with uneven surfaces. Figure 3 schematically shows a spring mechanism 76 can be used to bias the wheels 28 against the floor. A variety of mechanisms can be used to raise and lower the wheel 28, including devices which raise and lower the entire powered wheel assembly 26. These would include levers, powered retraction devices, hydraulic actuators, crank-driven gears, etc. In a preferred embodiment, the wheels 28 can be lowered when the patient lift and transport device is turned on by a switch activation.

A mast 32 is connected to the wheeled chassis 12 and extends vertically upward. A boom 34 is preferably connected to the top of the mast 32. However, in some configurations the boom 34 might be connected at a point other than the top of

the mast 32. All that is required is that the patient lift and transport device 10 be equipped with some mechanism whereby the boom 34 is positioned above the wheeled chassis 12. The patient will be hoisted from a prone or sitting position with the boom 34 using a sling or other suitable device (not shown). In the preferred embodiment, the lift and transport point 36 is located on the end of the boom 34. In the apparatus shown in Figures 1a and 1b, the lift and transport point 36 is shown as a pair of spaced apart flanges with an aperture therethrough. In operation, a pin or other connector which includes a spreader arm could be connected at lift and transport point 36; however, a variety of different types of connectors and connections may be used within the practice of the present invention. Furthermore, the lift and transport point 36 may be located at points other than the very end of the boom (e.g., there may be a plurality of lift and transport points along the length of the boom). All that is required is that the boom 34 be able to be positioned such that the lift and transport point 36 is above a patient located in a bed, chair, commode, or other location. This requires the lift and transport point 36 to be spaced away from the mast 32.

In order to provide a stable platform for a patient suspended from boom 34, it is advantageous to have the arms 14 extend horizontally from the central crossing member a distance that is about the same distance as the boom 34 or the lift and transport point 36 on the boom. In the configuration shown in Figure 1a, it can be seen that the arms 14 on the wheeled assembly 12 can be slid under a bed with the boom 34 positioned over the bed. Once the patient is hoisted from the bed, the arms 14 prevent the patient lift and transport device 10 from toppling over under the weight of the patient. In certain circumstances, the path of the patient lift and transport device 10 will be obstructed, such as by a commode, seat, or other structure on which a patient is located or to be deposited. In these cases, it is advantageous to have the arms 14 rotate in a horizontal plane as is shown by arrows 38 in Figure 1a. This can be accomplished manually, or by using an electric power mechanism. Figure 3 shows a configuration where the battery 72 can power a drive mechanism 78 to rotate arms 14.

The patient lift and transport device 10 is operated by an attendant who exerts control over the direction of the device using a handle bar 42 or other mechanism

(e.g., a single handle, steering wheel or other configurations which perform the same operation of a handle bar). For example, in achieving a turn, an attendant will exert a pushing force on one side and a pulling force on the opposite side of the handle bar 42 so as to change the direction of the patient lift and transport device 10. Since the forward caster wheels 16 swivel in the direction dictated by the attendant, turning of the patient lift and transport device can be achieved easily. To maintain a straight-line forward motion, the attendant will exert only a light force on the sides of the handlebar to make small corrections in path maintenance and the powered wheel 28 will propel the lift 10 in the direction intended. In the preferred embodiment, the rear wheels are caster wheels 18 which will allow similar maneuverability of the patient lift and transport device 10 when the powered wheel 28 is translating in a reverse direction.

Figure 2 shows that the attendant can be provided with a control panel 44 on which various controls for the patient lift and transport device 10 are presented. For example, an ON/OFF button or switch 46 can be used to turn on the power to the machine. A battery level indicator 48 provides the attendant with an indication of the level of charge in the battery 72. A charging port 50 permits the battery to be charged using an external power source. A switch 52 can be used for controlling raising and lowering the boom 34. A switch 54 can be used for controlling the widening or narrowing of the arms 14. Various other dials, switches, displays and the like may also be provided on the control panel 44. For example, a dial may be provided which regulates the voltage delivered to the powered wheel assembly 26. This functions as a speed control which regulates the speed of rotation of the wheel 28 and ultimately the rate of travel of the patient lift and transport device. A switch can be provided to switch the powered wheel between rotating in a forward direction to rotating in a rearward direction.

In an embodiment shown in Figure 2, toggle switch 43 is used to switch between forward and reverse directions, and to automatically raise and lower the wheel assembly 26. In operation, when the toggle switch 43 is activated, the wheels are automatically lowered to a floor contacting position. If the attendant's finger is removed from the switch 43 for more than a preset period of time (e.g., 1-3 seconds),

a computer control will direct a pulse to the powered wheel assembly to send a reverse pulse of power thereto so as to act an electronic brake. This prevents the continued forward or reverse motion of the patient lift and transport unit 10. In addition, the wheels 28 of the powered wheel assembly 26 will be lifted from contact with the floor. With reference to Figure 3, a computer controlled lifting and lowering mechanism 75 can be provided to accomplish the above operations with respect to the powered wheel assembly 26.

In addition, in an embodiment shown in Figure 2, a gear switch 45 can operate in conjunction with toggle switch 43 to regulate speed of the patient lift and transport unit 10. In particular, gross speed control functions can be controlled by operating gear switch 45 and fine speed control functions can be controlled by operating toggle switch 43. In operation, the attendant would move the toggle switch 43 further up or further down to go relatively faster or slower, and the speed could be increased by operating gear switch 45. Of course, it will be understood by those of skill in the art that other speed control mechanisms can be used in the practice of the invention.

Figure 1a shows that electrical wires 56 connect the controls on panel 44 to the various operable members of the patient lift and transport device.

Figure 1a also shows that a hydraulic drive 58 is connected to the boom 34 for raising and lowering the boom. Mechanical, electrical and other drives could be used in a similar manner to the hydraulic drive 58 in the practice of this invention. One end of the hydraulic drive 58 is connected to a load bearing member such as a point on mast 32, and the other end is connected to a point 62 on the boom 34 between the patient lift and transport point 36 and its rear end 64. A pivot pin 66 connects the boom 34 to the mast 32, such that as the hydraulic lift 58 expands, the end of the boom 34 holding the patient is lifted vertically by pivoting on pivot pin 66. Of course, it should be understood that a variety of alternative configurations may be used for raising and lowering the boom 34. For example, a portion of the mast 32 may be configured to extend from and retract into a housing whereby the mast 32 would lift the boom 34 directly. Figure 1b shows electrical connections between the control panel 44 and a hydraulic drive 68 located at the base 60 of the hydraulic lift 58.

While the invention has been described in terms of its preferred embodiments,

those skilled in the art will recognize that the invention can be practiced with modification within the spirit and scope of the appended claims.

CLAIMS

We claim:

1. A patient lift and transport apparatus, comprising:

a wheeled chassis;

a mast connected to said wheeled chassis which extends vertically from said wheeled chassis;

a steering handle connected to said mast for steering said wheeled chassis;

a boom connected to said mast at a position located vertically above said wheeled chassis, said boom having a lift and transport point at a location spaced away from said mast for connecting a patient holder, said boom being moveable upward and downward in a vertical plane; and

at least one powered wheel assembly connected to said wheeled chassis, said powered wheel assembly selectively providing motive force to propel the wheeled chassis in a desired direction.

2. The patient lift and transport apparatus of claim 1 wherein said powered wheel assembly has at least one wheel.

3. The patient lift and transport apparatus of claim 2 wherein said at least one wheel is selectively engageable with and disengageable from a floor or other surface while wheels on said wheeled chassis remain in contact with said floor or other surface.

4. The patient lift and transport apparatus of claim 2 wherein said at least one wheel is fixed so as to roll in only linear translation in forward and reverse directions.

5. The patient lift and transport apparatus of claim 4 wherein said wheeled chassis includes caster wheels.

6. The patient lift and transport apparatus of claim 1 further comprising a speed control which regulates a speed of rotation of at least one wheel of said powered wheel assembly.

7. The patient lift and transport apparatus of claim 1 further comprising

a pivot pin connecting said boom to said mast; and

a drive connected at a first end to said boom at a point located between said pivot pin and said lift and transport point, and connected at a second end to load bearing point,

wherein said boom is moveable upward and downward in said vertical plane by said drive acting against said boom at said first end and said boom pivoting at said pivot pin.

8. The patient lift and transport apparatus of claim 7 wherein said load bearing point is located on said mast.

9. The patient lift and transport apparatus of claim 1 wherein said wheeled chassis includes at least one wheel which can be locked to prevent rolling of said wheeled chassis.

10. The patient lift and transport apparatus of claim 1 wherein said wheeled chassis includes at least two caster wheels, the swivel capability of which can be locked to prevent movement of the caster wheels in the yaw direction.

11. The patient lift and transport apparatus of claim 1 wherein said wheeled chassis includes

a central crossing member having two ends and a front side and a back side;

two rearward wheels connected to the back side of said central crossing member; and

two forward wheels connected to the front side of said central crossing member.

12. The patient lift and transport apparatus of claim 11 wherein said mast and said powered wheel assembly are connected to said central crossing member.

13. The patient lift and transport apparatus of claim 12 wherein said powered wheel assembly is positioned in front of said mast and on said front side of said central crossing member.

14. The patient lift and transport apparatus of claim 11 further comprising a housing positioned on said central crossing member, and a battery power source positioned within said housing.

15. The patient lift and transport apparatus of claim 11 wherein said two forward wheels are spaced from said central crossing member by two arm members, each associated with one of said two forward wheels.

16. The patient lift of claim 15 wherein each of said two arm members extend from said crossing member at least a same distance as said lift and transport point on said boom is spaced away from said mast.

17. The patient lift and transport apparatus of claim 15 wherein each of said arm members are rotatable in a horizontal plane about a pivot point located at said central crossing member so as to enlarge or contract a width of a base of said wheeled chassis.

18. The patient lift and transport apparatus of claim 1 further comprising a computer controlled lifting and lowering mechanism connected to said powered wheel assembly.

19. The patient lift and transport apparatus of claim 18 wherein said computer

controlled lifting and lowering mechanism automatically directs said powered wheel assembly to a ground engaging position upon activation of the powered wheel assembly, and wherein said computer controlled lifting and lowering mechanism automatically directs said powered wheel assembly to a non-ground engaging position upon de-activation of the powered wheel assembly.

20. A patient lift and transport device, comprising:

a wheeled chassis having a plurality of caster wheels;

a mast and boom assembly connected to said wheeled chassis for lifting and lowering a patient; and

at least one powered wheel which is fixed to roll in only linear translation in forward and reverse directions.

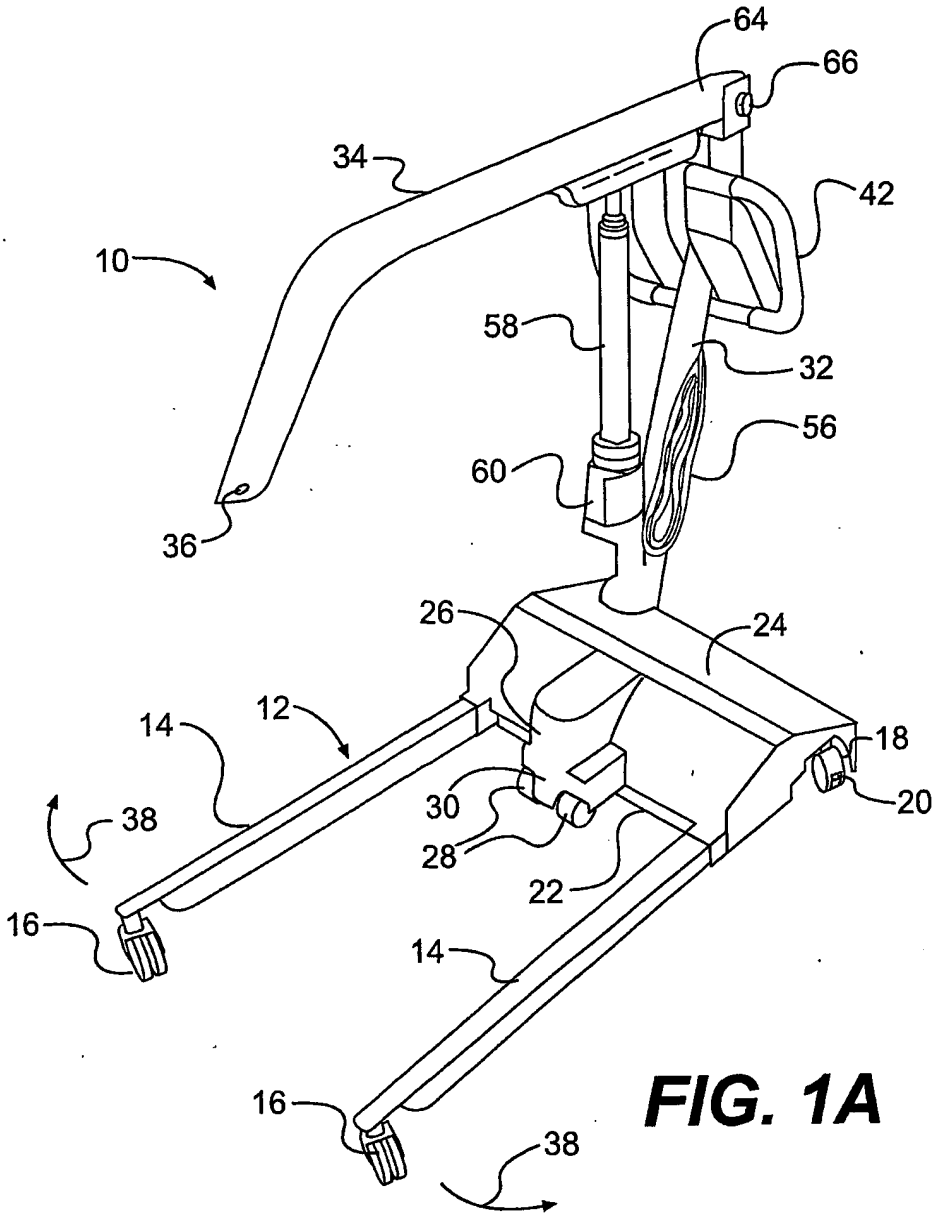


FIG. 1A

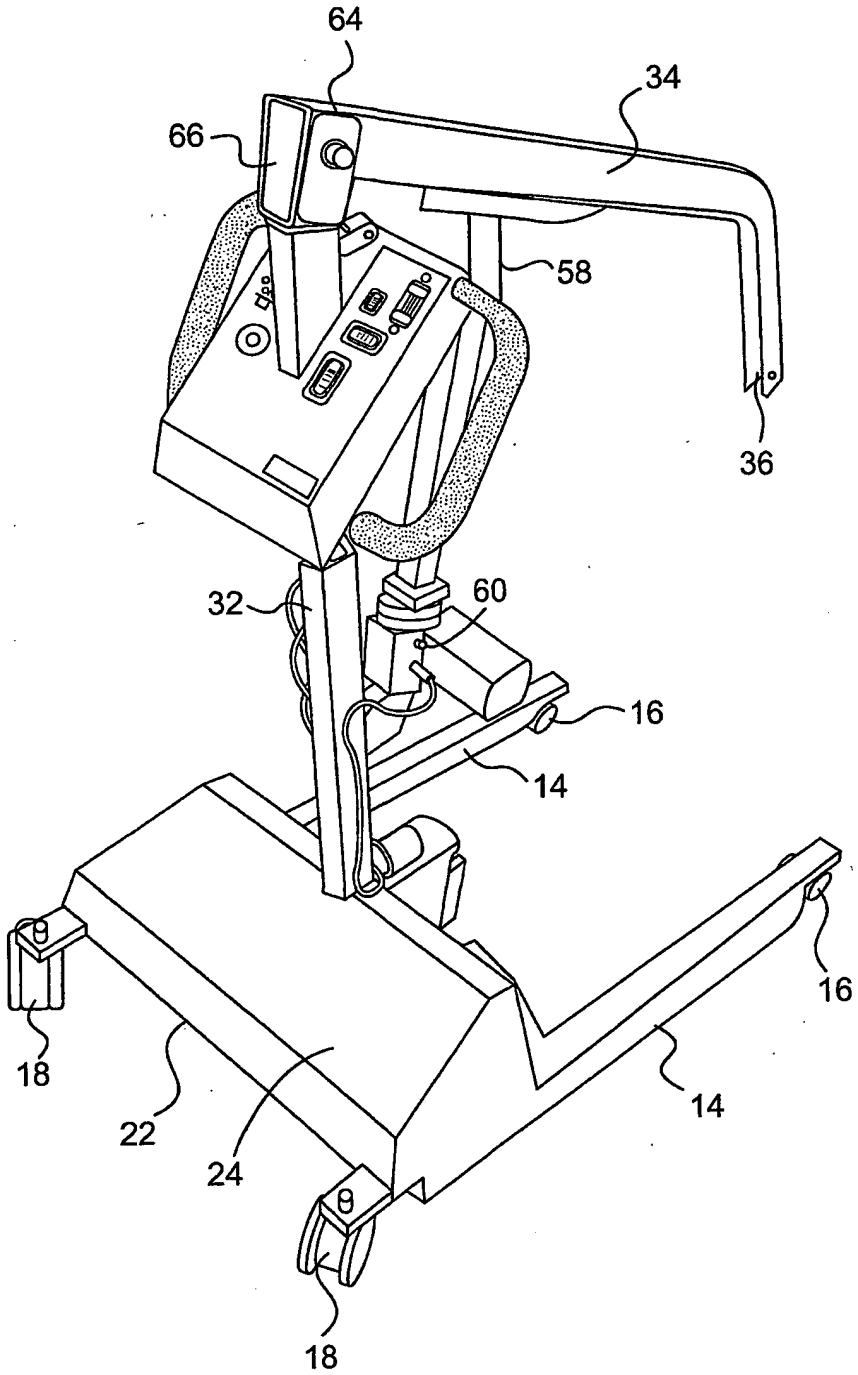


FIG. 1b

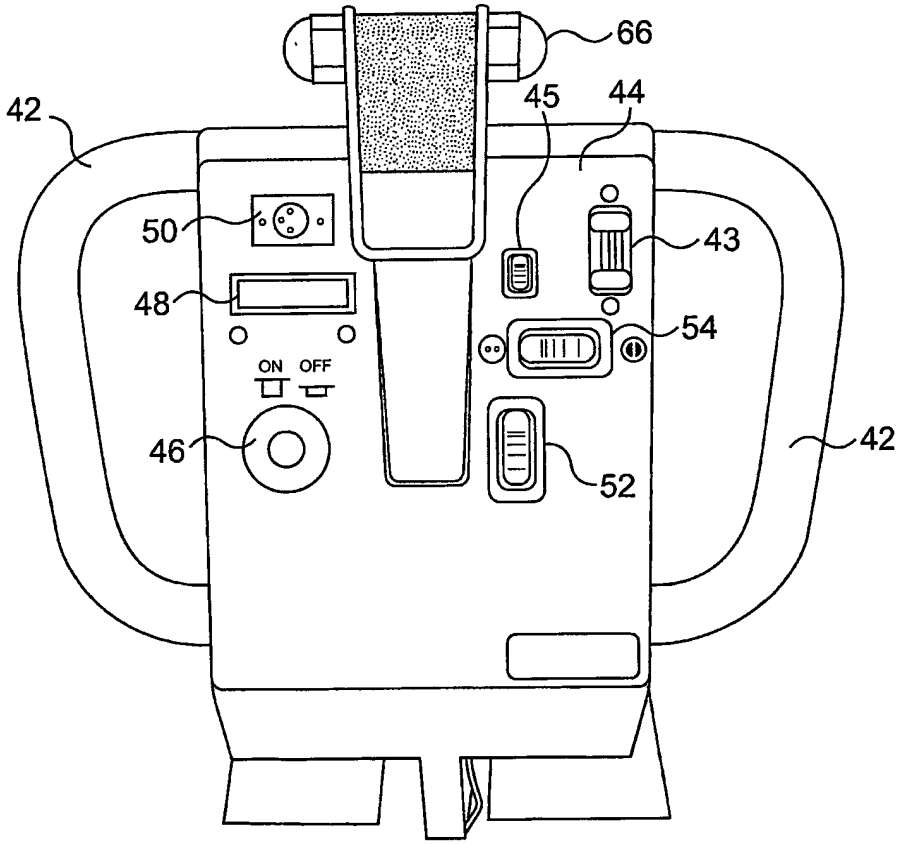


FIG. 2

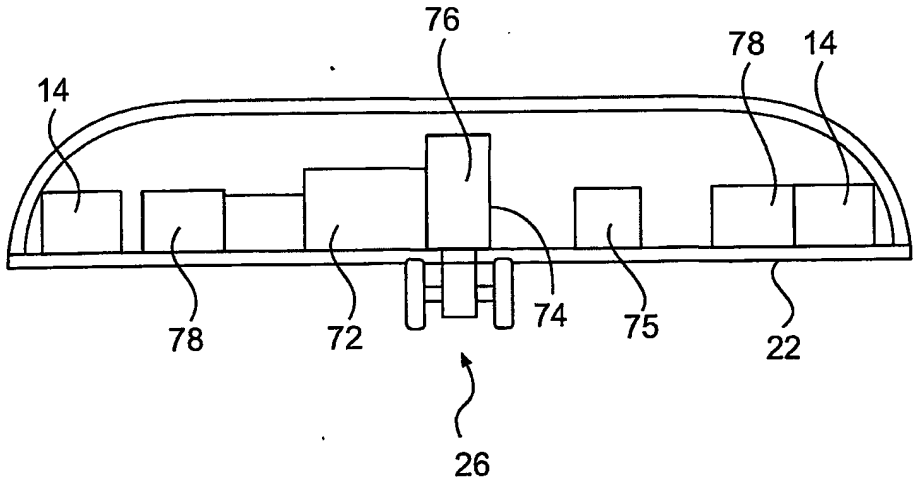


FIG. 3

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 September 2002 (26.09.2002)

PCT

(10) International Publication Number
WO 02/074216 A3

(51) International Patent Classification[7]: A61G 7/14

(21) International Application Number: PCT/US02/08015

(22) International Filing Date: 15 March 2002 (15.03.2002)

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

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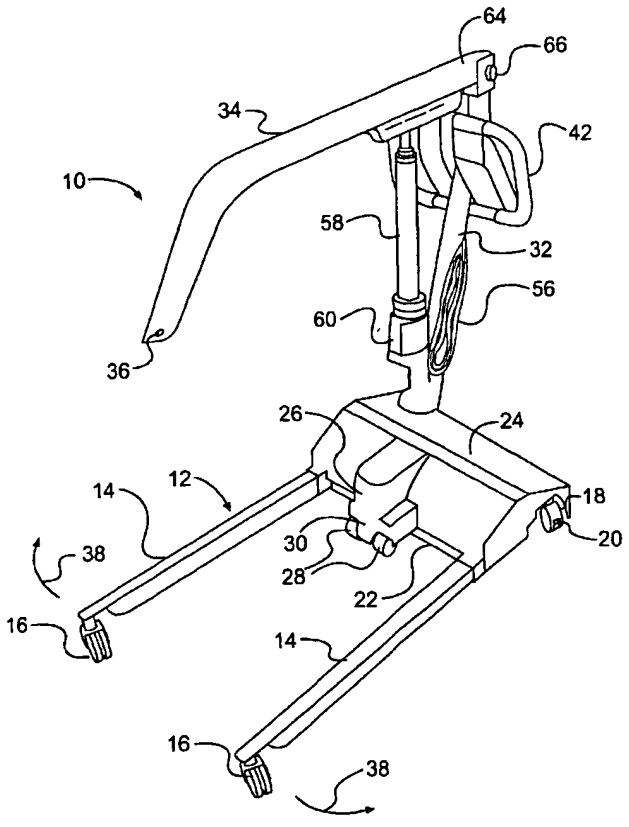

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WO 02/074216 A3

European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

(88) Date of publication of the international search report:
30 October 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US02/08015

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : A61G 7/14
US CL : 5/86.1
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 5/86.1, 81.1, 83.1, 84.1, 85.1, 87.1, 89.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,708,993 A (Campbell et al) 20 January 1998 (20.01.1998), Figs 1 and 2, column 6, lines 1 to 62.	1, 2, 6, 9, 1018, 20
X	US 5,758,371 A (VanDyke et al) 02 June 1998 (02.06.1998), Figs. 2 and 4-6, columns 3-10.	20
A	US 6,289534 B1 (Hakamiun et al) 18 September 2001 (18.09.2001)	1-20
A	US 3,469,269 A (Brown) 30 September 1969 (30.09.1969)	1-20
A	US 6,178,575 B1 (Harada) 30 January 2001 (30.01.2001), Figs. 4-8.	2-4

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Date of the actual completion of the international search
20 June 2002 (20.06.2002)

Date of mailing of the international search report
11 DEC 2002

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Form PCT/ISA/210 (second sheet) (July 1998)